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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/914,404	12/13/2001	Richard Spitz	10191/1993	5115

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KENYON & KENYON
ONE BROADWAY
NEW YORK, NY 10004

EXAMINER	
ESTRADA, MICHELLE	
ART UNIT	PAPER NUMBER
2823	

DATE MAILED: 12/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/914,404	SPITZ ET AL.	
	Examiner	Art Unit	
	Michelle Estrada	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 November 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *13,16-18,20-28 and 30-40* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *13,16-18,20-28 and 30-40* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 13, 16-18, 21, 22, 25, 28 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Rosnowski (4,099,997) and Schwalke (5,496,765) and further in view or Weijland (3,907,615).

Rosnowski discloses applying a solid glass layer (18/19) by chemical vapor deposition (Col. 2, lines 24-25), provided with a dopant on at least one of two sides of the semiconductor wafer (12); heating the semiconductor wafer to a high temperature (Col. 2, lines 44-45) so that the dopant from the solid glass layer penetrates deep into the semiconductor wafer to produce the at least one doped region (28/32) (Col. 3, lines 11-18); removing the solid glass layer (Col. 3, lines 41-42); and providing a dopant dosage of at least $1x10^{18}$ atoms/cm^3 (Col. 3, lines 15-17); wherein the step of heating the semiconductor wafer is performed in an oxidizing atmosphere (Col. 2,lines 44-48); maintaining the high temperature for about 20 to 140 hours, this range overlaps with that of the present invention; wherein the solid glass layer is applied both on the front side of the semiconductor wafer and on the back side of the semiconductor wafer, the doping type of the dopant on the back side being opposite compared to the doping type of the dopant on the front side (Col. 2, lines 20-23); wherein the solid glass layer has a

dopant constituent of 17% to 20% by weight (Col. 2, lines 29-30); wherein the solid glass layer has a thickness of about 6000Å.

Rosnowski does not disclose the chemical vapor deposition operation is performed as atmospheric pressure; the solid glass layer has a dopant constituent of about 3 to 6 percentage by weight; and that the step of removing the solid glass layer is performed in accordance with hydrofluoric acid.

Schwalke discloses depositing a doped glass (BSG) layer (7) on a semiconductor wafer 1 by a CVD method at atmospheric pressure (APCVD) (Col 4, lines 26-28; the doped glass has a dopant constituent of 4% by weight, this overlaps the range of the instant invention (Col. 4. lines 29-30); heating the wafer to diffuse the dopants and removing the glass layer using hydrofluoric acid (Col. 4,lines 48-51).

It would have been within the scope of one of ordinary skill in the art to combine the teachings of Rosnowski and Schwalke to enable formation of the doped glass layer and further removing the glass layer after formation of diffusion region avoids an uncontrolled drive-out from these layers or a contamination of the equipment during the course of the further process execution (Col. 1,lines 62-64).

The combination of Rosnowski and Schwalke does not disclose that the high temperature is between 1200 °C and 1280 °C.

Weijland discloses depositing glass (13) on both surfaces of semiconductor substrate and heating at 1280 °C, which overlaps the range of 1200 °C to 1280 °C, to diffuse the dopants into the substrate (Col. 5, lines 19-22, Col. 5, lines 35-40).

It would have been within the scope of one of ordinary skill in the art to combine the teachings of Rosnowski, Schwalke and Weijland to enable formation of the desire dopant diffusion into the substrate.

The choice of a particular thickness for the solid glass layer would have been a matter of routine optimization because thickness is considered a result effective variable. See MPEP 2144.05.

Claims 20, 23, 24, 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Rosnowski, Schwalke and Weijland as applied to claims 13, 16-18, 21, 22, 25, 28 and 30 above, and further in view of Evans Jr., et al. (4,104,091).

Rosnowski discloses wherein silane gas and B_2H_6 gas is used in the chemical vapor deposition to generate silicon dioxide and p-type dopants.

The combination of Rosnowski, Schwalke and Weijland does not disclose that the doping type of the dopant on the backside of the semiconductor wafer being opposite or different compared to the doping type of the dopant in the front side.

Evans Jr. et al. discloses depositing two layers of doped glass on opposed surfaces of a semiconductor substrate; the dopant of the second layer of doped glass must be of a different type of conductivity from that of the first dopant glass (Col. 7, line 40-Col. 8, line 14); and heating to diffuse dopants from the glass to the substrate.

It would have been within the scope of one of ordinary skill in the art to combine the teachings of Rosnowski, Schwalke, Weijalnd and Evans Jr., et al. to enable formation of the doped glass layer of the combination and further providing different type of dopants having different diffusion rates.

Claims 26 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Rosnowski, Schwalke and Weijland as applied to claims 13, 16-18, 21, 22, 25, 28 and 30 above, and further in view of Shinohara (JP 59-80928).

The combination of Rosnowski, Schwalke and Weijland does not disclose further applying a neutral glass layer on the solid glass layer prior to heating the semiconductor wafer; and removing the neutral glass layer together with the solid glass layer after heating the semiconductor wafer; the neutral glass layer has a thickness of about 0.5 micrometers.

Shinohara discloses applying a neutral glass (13) on a substrate (1) prior to heating the semiconductor substrate and removing the neutral glass after heating (Abstract and Figs. 3 and 4).

It would have been within the scope of one of ordinary skill in the art to combine the teachings of Rosnowski, Schwalke, Weijland and Shinohara to enable formation of the heavily doped semiconductor components of the combination and further the neutral glass layer protects the solid glass layer and prevents the dopants from leaking to the atmosphere.

The choice of a particular thickness for the neutral glass layer would have been a matter of routine optimization because thickness is considered a result effective variable. See MPEP 2144.05.

Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Rosnowski, Schwalke, Weijland and Evans Jr., et al. as applied to claims 20, 23, 24, 31 and 32 above, and further in view of Tanigawa (6,020,644).

The combination of Rosnowski, Schwalke, Weijland and Evans Jr., et al. does not disclose that silane PH_3 gas is used in the chemical vapor deposition to generate silicon dioxide and n-type dopants.

Tanigawa discloses using silane gas and PH_3 gas in the chemical vapor deposition to generate silicon dioxide and n-type dopants (Col. 8, lines 35-50).

It would have been within the scope of one of ordinary skill in the art to combine the teachings of Rosnowski, Schwalke, Weijland, Evans Jr. and Tanigawa to enable formation of the glass structure.

Claims 34-37 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Rosnowski, Schwalke, Weijland and Evans Jr., et al. as applied to claims 20, 23, 24, 31 and 32 above, and further in view of Sun et al. (5,834,346).

The combination of Rosnowski, Schwalke, Weijland and Evans Jr., et al. does not disclose wherein tetra-ethyl-ortho-silicate gas and trimethyl borate is used in the chemical vapor deposition to generate silicon oxide and p-type dopants; and wherein

the tetra-ethyl-ortho-silicate gas and trimethyl phosphate is used in the chemical vapor deposition to generate silicon dioxide and n-type dopants.

Sun et al. disclose wherein tetra-ethyl-ortho-silicate gas and trimethyl borate is used in the chemical vapor deposition to generate silicon oxide and p-type dopants; and wherein the tetra-ethyl-ortho-silicate gas and trimethyl phosphate is used in the chemical vapor deposition to generate silicon dioxide and n-type dopants Col. 2, lines 7-16).

It would have been within the scope of one of ordinary skill in the art to combine the teachings of Rosnowski, Schwalke, Weijland, Evans Jr., et al. and Sun et al. to enable formation of the glass layer.

Claims 38 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Rosnowski, Schwalke, Weijland, Evans Jr., et al. and Sun et al. as applied to claims 34-37 and 40 above, and further in view of Shinohara (JP 59-80928).

The rejection is applied as above in the rejection of claims 26 and 27.

Response to Arguments

Applicant argues that Rosnowski does not disclose the feature of heating a semiconductor wafer to a high temperature of at least 1200 degrees centigrade. However, claim 13 was not so limited. Claims 29 and 30 recited this limitation which

was addressed in the rejection of claims 20,23,24,29 and 30 in the Office Action mailed 5/2/03.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicant argues that Schwalke does not disclose or suggest in any way that APCVD would be advantageous in the context of applying a solid glass layer for diffusion doping as recited in the context of the claim. It is not necessary for Schwalke to disclose solving the same problem or obtaining the same advantages as the instant application. It is sufficient that there is motivation to combine the references and that the process of the combination is encompassed by the instant claims.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Applicant argues that there is lack of motivation to combine the references. However, motivation has been provided in the Office Action mailed 5/2/03.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michelle Estrada whose telephone number is (703) 308-0729. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

George Fourson
Primary Examiner
Art Unit 2823

MEstrada
November 25, 2003